Federal Democratic Republic of Ethiopia

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ET 472 (2000) (English): SEEDS - PURITY ANALYSIS

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ETHIOPIAN
STANDARD

ES 472:2000

(Reaffirmed :2012)

First edition

Seeds - Purity analysis

ICS: 65.020.20

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Foreword

This Ethiopian Standard has been prepared under the direction of Technical Committee for seeds (TC 16) and published by the Ethiopian Standards Agency (ESA).
The technical contents in the text of this Standard are identical with ES 472:2000 edition while the reissued standard carries some editorial and technical changes observed in the course of systematic review.

Acknowledgement has been made for the use of the indicated publication.
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Seeds — Purity analysis

1 Scope

This Ethiopian Standard specifies the method of purity analysis of sampled seed for determining the percentage composition of the sample by weight being tested and by inference the composition of the seed lot, and the identify of the various species of seeds and inert particles constituting the sample.

2 Normative references

The following standard contain provision which, through reference in this text, constitute provision of this Ethiopian Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this Ethiopian Standard are encouraged to investigate the possibility of applying the most recent editions of the Ethiopian Standards indicated below. Registers of currently valid standards are maintained in the Quality and Standards Authority of Ethiopia.

ES 413:2000, *Seeds – Terminology*.

ES 471:2000*, Seeds – Sampling.*

ES 477:2000*, Seeds – Verification of species and cultivars.*

3 Definitions

For the purpose of this standard, the definitions in ES 413 and the following shall apply.

3.1
pure seed
the species stated by the sender, or found to predominate in the test, and shall include all botanical varieties and cultivars of the species. following structures (even if immature, under sized, shrivelled diseased or germinated, provided they can be definitely identified as of that species) shall be regarded as pure seed, unless transformed into fungal sclerotia, smut balls, or nematode galls

3.1.1
intact seeds
commonly found dispersal unit ie achenes and similar fruits, schizocarps, florets etc and mericarps, with or without hairy perianth unless it is readily apparent that no true seed is present

3.1.2
pieces of seeds
achenes, maricarps and caryopses, resulting from breakage, that are more than one half of their original size. However, seeds of the Leguminosae, cruciferae and confierae with the seed coats entirely removed shall be regarded as inert matter

3.1.3
clusters of beta
except genetic monogerm cultivar seed unit larger than a certain size are classified as pure seed

3.1.4
in certain genera of gramineae

I. florets and one-flowered spikelets with an obvious caryopsis containing endosperm, provided also that the caryopses of particular genera and species have attained minimum sizes as prescribed in Annex 2 are considered to be pure seeds

II. free caryopses: All florets and caryopses (except broken florets and caryopses half or less than half the original size and, in the case of dactylis glomerata excluding one fifth of the weight of multiple florets in which the sterile floret extends to or beyond the tip of the fertile floret) remaining in the heavy portion after blowing at the uniform blowing point

3.2
other seeds

include seed units and seed like structures of any plant species other than that of pure seed. With inert respect to classification as other seeds or inert matter the distinguishing characteristics set out for pure seed shall also be applicable to other seeds except that

3.2.1
beta seed units

are evaluated without sieve using the pure seed definition for monogerm cultivars

3.2.1.1
seed units of pieces

which a uniform blowing procedure applies are evaluated without blowing

3.2.1.2
multiple seed

units /MSU/shall be separated and the single units classified according to the general principles in clause 4.2

3.2.1.3
cuscut a spp.

seed units which are fragile and ashen grey to creamy white in colour are classified as inert matter

3.3
inert matter or other matters

are seed units, seed like structures, soil, sand, stones, chaff, stems, leaves, cone seales, wings pieces of seeds of cuscuta spp. which are fragile or ashen grey to creamy white in color bark, flowers, nematode galls, fungus bodies (such as ergot sclerotia and bunt balls), caryopses of Gramineae replaced by insect larvae and all other matter not seeds which are not defined as pure seeds or other seeds include

3.3.1
seed units and seed like structure

seed units in which it is readily apparent that no true seed is present

Pieces of broken or damaged seeds, achenes, mericarps and caryopses half or less than half seeds of the original size Leguminous, Crucifareae and Confierae with the seed coats entirely removed and structures defined in clause 3.1.1 in which it is readily apparent that no true seed is present

3.3.1.1
clusters of Beta seed units

except genetic monogerm cultivars or pieces of such clusters, which pass through a 200 x 300 mm rectangular sieve size with square - ended slits 1.5 x 20 mm when shaken for one minute

3.3.1.2
empty glumes, lemmas, paleas

unattached sterile florets and florets with a caryopsis less than the minimum size as described in the Annex 2

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3.3.1.3
separation method
when the separation is made by the uniform blowing method, the following material shall be regarded as inert matter

a) in the light portion

all material except other seeds (as defined in clause 3.1)

b) in the heavy portion

broken florets and caryopses half or less than half the original size and all other matter except pure seed

one-fifth of the weight of multiple florets of Dactylis glomerata in which the sterile floret extends to or beyond the tip of the fertile floret

seeds of Leguminosae, Cruciferal, Cupessaceae, Pinaceal and Taxadiaceae with the seed coat entirely removed.

4 Principlles

4.1 The working sample shall be separated into the following three component parts: pure seed, other seeds, inert matter, and the percentage of each part shall be determined by weight.

4.2 All species of seed and each kind of inert matter present shall be identified as far as possible and, if required for reporting, its percentage by weight shall be determined.

4.3 Examination of the working sample may provide evidence as to the provenance of the seed and , if required, this may be supplemented by examination of the reminder of the submitted sample, or part of it.

5 Apparatus

The following apparatus shall be used:

a) Reflected light, magnifiers, sieves and parts

b) The type of blower to be used for species and cultivars of Gramineae is described in Annex 1.

c) The sieve to be used in the special procedure for Beta vulgaris (other than genetic monogerm cultivars) is specified in clause 3.3.1.1.

6 Sampling

Samples shall be taken in accordance with ES 471.

7 Procedure

7.1 Working sample

7.1.1 The purity analysis shall be made on a working sample taken from the submitted sample in accordance with ES 471 except for species of the Garmineae for which uniform blowing method is to be used, the size of the working sample shall be,

a) Either, a weight estimated to contain at least 2,500 seeds, subject to a minimum of 0.5g and maximum of 1,000 g;

b) Or not less than the weight indicated in column 4 of table 8 ES 471.

7.1.2 The analysis shall be made on one working sample of this weight or on two sub-samples of at least half this weight, each independently drawn.

7.2 Weighing

The working sample (or each sub-sample) shall be weighed in grams to the minimum number of the decimal places necessary to calculate the percentages of its component parts to one decimal place. The number of decimal places necessary for weighing is as indicated below:

7.3 Separation

Weight of working sample in grams	Number of decimal places
Less than 1.0000	4
1.000 to 9.999	3
10.00 to 99.99	2
100.0 to 999.9	1
1000 or more	0

7.3.1 The working sample (or sub-sample) after weighing, shall be separated into its component parts as defined in clause 3.1 herein. In general, the separation shall be based on an examination of each particle in the sample, but in certain cases special procedures are obligatory.Such as uniform blowing or sieving. The separation of the pure seed must be on such a basis that it can be definitely made by visible or mechanical seed characteristics without impairing the capacity for germination.

7.3.2 Seeds enclosed in fruits other than those indicated in clause 3.1.1 herein shall be separated and the detached empty fruit classed as inert matter.

7.3.3 In confierae (except cupressaceae and the wing and enclosing integument, if present, shall be detached and placed in the inert matter fraction, unless the integument is difficult to remove in normal seed processing without damage to the seed, in which case the wing only shall be removed.

7.3.4 In gramineae, a floret or one flowered spikelet as defined in clause 3.1.4 (i) may have a sterile floret shall be detached and placed in the inert matter fraction, except in certain genera and species listed in Annex 2 herein. In these cases the sterile floret shall be left attached and included in the pure seed.

7.3.5 For Beta vulgaris except genetic monogerm cultivars clause 3.1.3 certain species and cultivars of Gramineae, special procedures are obligatory.

7.3.6 When it is difficult or impossible to distinguish between species, one of the following procedures may be followed.

a) Only the genus name is reported on the analysis certificate, all seeds of that genus (eg. both awned, awnless of Lolium) being classed as pure seed. Additional information may be reported under “other seed ES 473 other seed determinations” or ;

b) Similar seeds are separated from the other components and weighed together. From this mixture at least 100 seeds, and preferably about 1,000, are taken at random; a final separation is made on this portion and the proportion of each species determined by weight. From this proportion the percentage of each species in the entire sample can be calculated according to clause 8 herein. If this procedure is followed, the details shall be reported including the number of seeds examined.

7.3.7 After separation, each component part and any species of seed or kind of other matter of which a percentage is to be reported, shall be weighed in grams to the minimum number of decimal places necessary to calculate the percentage to one decimal place.

8 Expression of results

8.1 Method of calculation

8.1.1 The percentage by weight of each of the component parts shall be calculated to one decimal place.

8.1.2 The percentage of seed of any particular species other than the pure seed, or of any particular kind of inert matter need not be calculated except as required by the test report under clause 10.

8.1.3 Percentages shall be based on the sum of the weight of the components, not on the original weight of the working sample, but the sum of the weights of the components shall be compared to the original weight as a check against loss of material or other error.

8.1.4 If a duplicate analysis is made of two half-samples, the difference between the two shall not exceed the tolerance between duplicate analysis given in table 1 column 3 of clause 9 herein. If the difference is in excess of the tolerance the following procedures shall be employed.

8.1.5 Further pairs (but not more than four pairs in all) shall be analyzed until a pair is obtained which has its members within tolerance.

8.1.6 Any pair in which the difference between its members exceeds twice the tolerance shall be discarded.

8.1.7 The percentage of a fraction or component finally recorded shall be calculated from the weighed average of all remaining pairs.

8.1.7.1 The weighted average of a component shall be the sum of the weight of that component from all the samples divided by the sum of the weights of all components from all samples. To convert to percentage, the result shall be multiplied by 100.

8.1.7.2 When two or more species difficult to separate are in the sample and a final separation is made on a small fraction (400 to 1,000) of similar seeds, the following formula shall be used for calculating the percentage by weight of one of the species.

$$A = \frac{m_3 \text{ x } m_1}{m_2 \text{ x } m} X100$$

Where,

a *is the percentage by mass of the species*

m *is the mass of all similar seeds separated from the working sample*

m1 *is the mass of all similar seeds separated from the working sample*

m2 *is the mass of the small fraction (400 to 1,000 of similar seeds taken for final separation.*

m3 *is the mass of required species in m2*

8.2 When two or more purity analysis of whole working samples are made, the results shall be expressed as a weighted average percentage. All the results shall be included unless it is apparent that one or more of the results is due to error and not to random sampling in which case the incorrect is omitted.

9 Tolerance for purity tests

The following table shall indicate tolerance for comparing duplicate working samples from the same submitted sample for any component of a purity sample, for either chaffy or non-chaffy seed. The probability used shall be 0.05

Table 1 – Tolerances for purity tests

Average analysis two half samples or two whole samples		Tolerances for differences between	
		Half working samples	Whole working samples
1	2	3	4
99.95 - 100.00	0.00 - 0.24	0.23	0.16
99.90 - 99.94	0.50 - 0.09	0.34	0.24
99.85 - 99.89	0.10 - 0.14	0.42	0.30
99.80 - 99.84	0.15 - 0.19	0.49	0.35
99.75 - 99.79	0.20 - 0.24	0.55	0.39
99.70 - 99.74	0.25 - 0.29	0.59	0.42
99.69 - 99.69	0.30 - 0.34	0.65	0.46
99.60 - 99.64	0.35 - 0.39	0.69	0.49
99.55 - 99.59	0.40 - 0.44	0.74	0.52
99.50 - 99.54	0.45 - 0.49	0.76	0.54
99.40 - 99.49	0.50 - 0.59	0.82	0.58
99.30 - 99.39	0.60 - 0.69	0.89	0.63
99.20 - 99.29	0.70 - 0.79	0.95	0.67
99.10 - 99.19	0.80 - 0.89	1.00	0.71
99.00 - 99.09	0.90 - 0.99	1.06	0.75
98.75 - 98.99	1.00 - 1.24	1.15	0.75
98.50 - 98.74	1.25 - 1.49	1.26	0.81
98.25 - 98.49	1.50 - 1.74	1.37	0.89
98.00 - 98.24	1.75 - 1.99	1.47	0.97
97.75 - 97.99	2.00 - 2.24	1.54	1.04
97.50 - 97.74	2.25 - 2.49	1.63	1.09
97.25 - 97.49	2.50 - 2.74	1.70	1.20
97.00 - 97.24	2.75 - 2.99	1.78	1.26
96.50 - 96.99	3.00 - 3.49	1.88	1.33
96.00 - 96.49	3.50 - 3.99	1.99	1.41
95.50 - 95.99	4.00 - 4.49	2.12	1.50
95.00 - 95.49	4.50 - 4.99	2.22	1.57
94.00 - 94.99	5.00 - 5.99	2.38	1.68
93.00 - 93.99	6.00 - 6.99	2.56	1.81
92.00 - 92.99	7.00 - 7.99	2.73	1.93
91.00 - 91.99	8.00 - 8.99	2.90	2.05
90.00 - 90.99	9.00 - 9.99	3.04	2.15
88.00 - 89.99	10.00 - 11.99	3.25	2.30
86.00 - 87.99	12.00 - 13.99	3.49	2.47
84.00 - 85.99	14.00 - 15.99	3.70	2.62
82.00 - 83.99	16.00 - 17.99	3.90	2.76
80.00 - 81.99	18.00 - 18.99	4.07	2.88
78.00 - 79.99	20.00 - 21.99	4.23	2.99
76.00 - 77.99	22.00 - 23.99	4.37	3.09
74.00 - 75.99	24.00 - 25.99	4.50	3.18
72.00 - 73.99	26.00 - 27.99	4.61	3.26
70.00 - 71.99	28.00 - 29.99	4.71	3.33
65.00 - 69.99	30.00 - 34.99	4.86	3.44
60.00 - 64.99	35.00 - 33.99	5.02	3.55
50.00 - 59.99	40.00 - 49.99	5.16	3.65

10 Test report

The test report shall include the following information:

a) The result of a purity analysis shall be given to one decimal place and the percentage of all components shall be a total of 100. Components of less than 0.05% shall be reported as “Trace”;

b) The percentages of pure seed, other seed and inert matter shall be reported in the spaces provided on the analysis certificate. If the result for a component is nil, this must be shown as ‘-0 0-’ in the appropriate space.

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Annex 1

Aids such as reflected light and sieves are particularly useful for separating sterile florets of grasses and fragments of seed resulting from breakage, insect damage or disease.

Seed blowers can be used to separate light-weight material such as chaff and empty florets in grasses from the heavier seeds. Blowers that will give the most accurate separations will handle only small samples (one to five grams in weight). However, blowers that will handle 50 g samples, and larger, can be utilised. A good blower should provide a uniform blast of air, be capable of standardization and retain all the particles, which it separates. A manometer is desirable for standardizing the blower.

The blower used for the uniform blowing method must be capable of:

a) Blowing at different pressures (determined by the use of calibration samples) to suit species;

b) Maintaining a uniform flow of air along the tube at any required pressure;

c) Rapid adjustment to any pressure likely to be required. The setting to provide each pressure should be checked periodically by blowing a calibration sample;

d) The Latin name of the species of pure seed shall be reported on the Analysis Certificate. The kind of inert matter and the Latin name of each species of other seed shall be reported. Latin names shall be in accordance with table 1 of ES 471;

e) When a particular kind of inert matter or species of other seed is found to the extent of 1% or more and when at the request of the sender, a particular species has been determined and found to be present to the extent of 0.1% or more, the percentage of such material shall be shown on the analysis Certificate.

Annex - 2. gramineae

Caaryopses - In Lolium and Festuca a floret with a caryopsis one third or more of the length of the palea measured from the base of the rachilla is regarded as pure seed or other seed, but a floret with a caryopsis less than one third the length of palea is regarded as inert matter. In other genera or species a floret with any endosperm in the caryopsis is regarded as pure seed.

a) Sterile florets

In the following genra a sterile floret attached to a fertile floret is not removed, but left attached and included in the pure seed fraction - Avena, Chloris, Dactylis, Pancium, Setaria, and Sorghum.

b) Empty Glumes

“Glumes” shall mean only the subtending bracts at the base of the prikelet.

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Ethiopian Standards Agency

Organization and Objectives

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010.ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1970.

ESA's objectives are:-

- Develop Ethiopian standards and establish a system that enable to check weather goods and services are in compliance with the required standards,
- Facilitate the country's technology transfer through the use of standards,
- Develop national standards for local products and services so as to make them competitive in the international market.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational Institutions, research institutes, government organizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/ or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes.
Orders for all Ethiopian Standards, International Standard and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices. A catalogue of Ethiopian Standards is also available freely and can be accessed in from our website.

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International Involvement
ESA, representing Ethiopia, is a member of the International Organization for Standardization (ISO), and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the international Electro-technical Commission (IEC) and American Society for Testing and Materials (ASTM).It is a founding member of the African Regional Organization for standardization (ARSO).

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